

# **Towards Tomorrow's Cadastral Survey Industry**

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**Key words:** Cadastre, Land Management

## **SUMMARY**

Land Information New Zealand (LINZ) and the New Zealand Institute of Surveyors (NZIS) have conducted a joint study of what the New Zealand cadastral survey industry might be like in 10 years time. Having completed the move to an e-survey and e-dealing operating model with full digital lodgment including intelligent (structured) cadastral survey and land registration information, New Zealand needs to agree on a new strategic direction to guide future actions. The study group consisted of five LINZ and five NZIS members, headed by the LINZ Surveyor General and the NZIS President.

The paper defines the shared view of cadastral industry in 10 years time. For New Zealand this is mainly driven by an increasing number of emerging land based rights, the expanding use of cadastral information in a range of economic and social activities and the expectation of technology to improve the collection, processing and access of cadastral information.

The future view is based on the principles; coordinated repositories of information to establish the spatial extent of all rights empowered by statute; protecting right of tenure; central and local government working with private sector; addressing legacy information and changes over time; and Information quality, access and legibility characteristics that reflect the information age. It is also set in the context of the micro level – generating and integrating survey information into the cadastre - and the macro level – the wider application of that information – with the various people and groups that interact and generate the industry.

The paper identifies challenges to be addressed in moving towards the tomorrow view. Examples from the micro level are how the access to current cadastral information supports wider application, the quality and access to advice available to cadastral surveyors in doing their work, the research and qualification capability that supports the industry, and the suitability of Landonline technology to support the industry for the next 10 years. At the macro level the challenges are sector wide – how the emerging rights will be developed, legislated, regulated and administered across central and local government so they can be exercised for the benefit of New Zealand economy, society and environment, and the awareness, willingness and ability of people and groups to act in a sector wide information based environment.

In moving towards tomorrow's cadastral survey industry the papers recommends LINZ and NZIS executive bodies agree on the strategic view and develop the identified actions that overcome the challenges.

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## **1. INTRODUCTION**

The joint working group between Land Information New Zealand (LINZ) and the New Zealand Institute of Surveyors (NZIS) examined the future of the cadastral survey industry and formed a shared view of tomorrow's state of the cadastral survey industry in New Zealand, how key players contribute and what it will take to get there.

New Zealand has a "Torrens" land registrations system based on parcels of land surveyed by licensed surveyors and lodged for approval with LINZ. Since 2008, all surveys have been required to be lodged digitally (e-surveys) and include intelligent (structured) survey information. Processing by LINZ includes a mixture of automated and manual validation followed by integration of the new data into the cadastral database – including network adjustment of the spatial representation of the cadastre.

## **2. AIM**

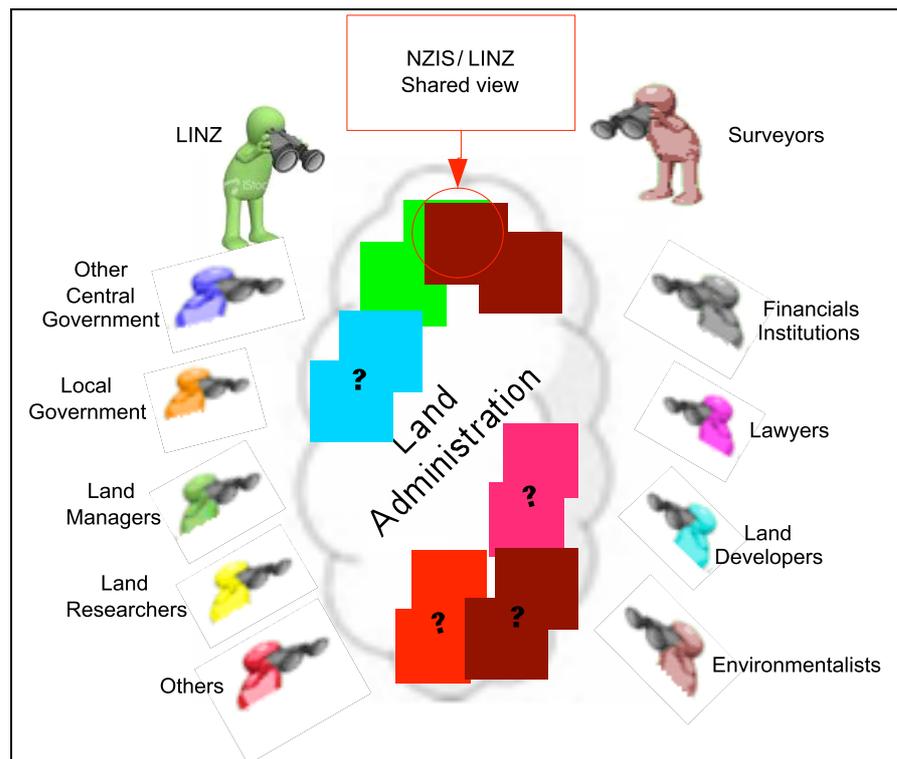
This paper recommends a shared view of the future cadastral survey industry and associated strategic objectives to the LINZ Executive and the NZIS Council as the basis for moving into the future.

## **3. METHOD**

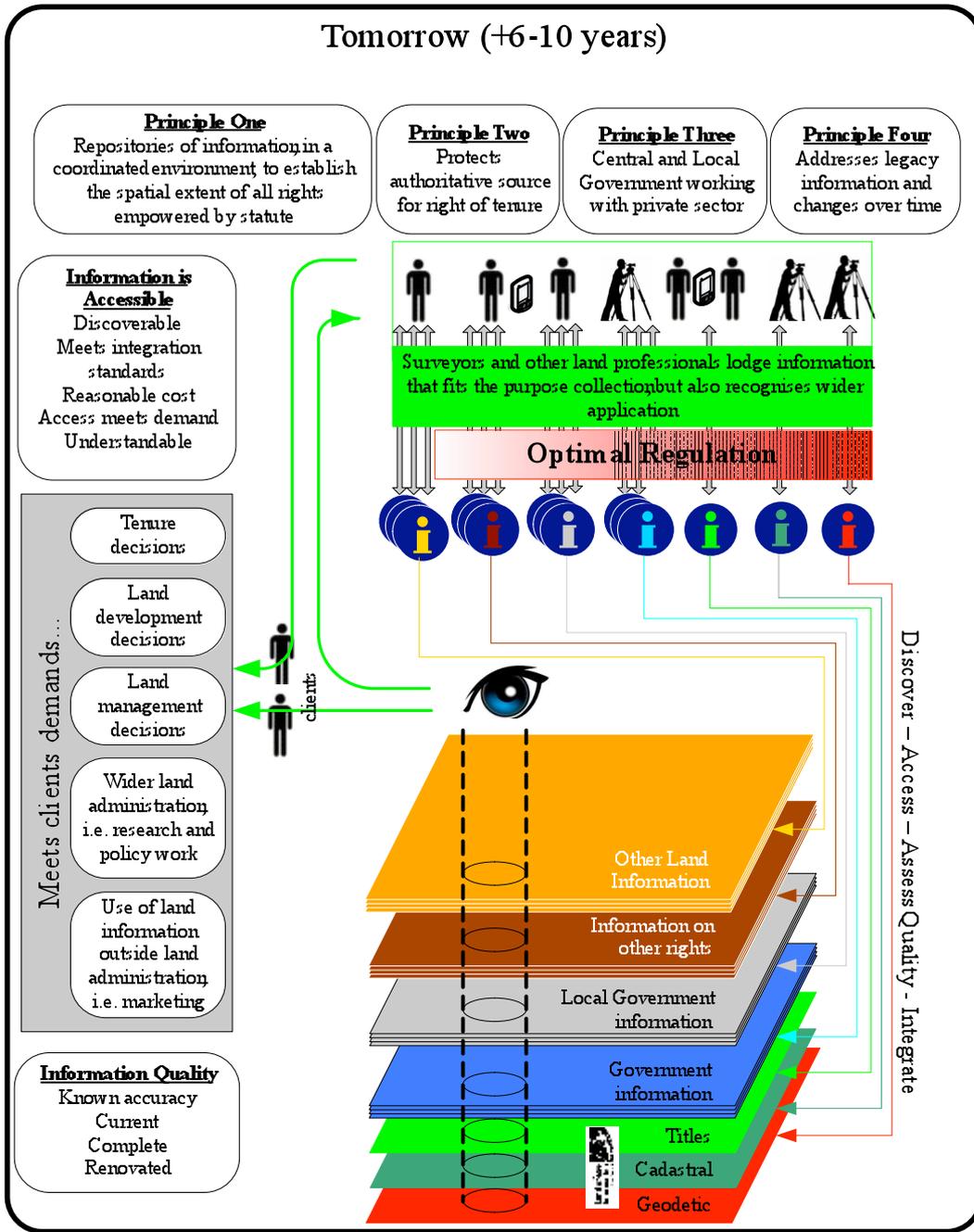
In forming the shared view and strategic objectives the working group:

- Conducted a study with three sessions:
  - The possible future
  - The challenges in moving from today to the future
  - What can be done to overcome these challenges
- Considered:
  - International benchmark (Cadastre 2014, A Vision for a Future Cadastral System (FIG Commission 7) and associated papers)
  - New Zealand legislative and regulatory factors
  - Context of New Zealand markets
  - Industry demands
  - More than 40 submissions from survey professionals and people from the wider industry

- A broad view was taken of the scope of the cadastral system rather than limiting it to those areas where surveyors and LINZ currently engage with each other through lodgment and processing of cadastral survey transactions and supply of cadastral information to users.
- As a consequence of taking this broad view, the working group established that they were only able to see part of the picture of the role of the cadastre within the wider system of land administration. The options were to wait, take the time to get everyone together and get the whole picture, or focus now on our small but significant area and then build that greater understanding over time. The working group decided to develop the cadastral view to start moving forward. Other users of the cadastre and stakeholders in land administration may enhance this view in the future.



#### 4. THE FUTURE OF THE CADASTRAL SURVEY INDUSTRY



#### **4.1. Principle One. Repositories of information, in a coordinated environment, to establish the spatial extent of all rights empowered by statute.**

- There is no single agency or database that can be expected to contain all future cadastral-related information of the future (within the broad scope of the cadastre considered by the working group). However, each different piece, or database, of this information contributes to the complete picture that will be used by the industry.
- ‘Rights empowered by statute’ is a dynamic statement for those parcels considered to be in scope allowing for information to support rights not yet fully established within the cadastral industry. One such area is customary rights, many of which are currently draped in ambiguity. In future, some provision for these rights will be needed as for other rights or interests.
- The machinery of government (the method of allocating functions to government agencies) identifies the agency responsible for administering each right in statute. Where spatial definition is required, that agency would establish a system to capture that information. Coordination is through:
  - Sector-wide visibility of who holds what information, so the complete picture is easily ascertained.
  - A sector-wide optimal regulation regime so the industry, and government, is assured that the quality of the information matches the purpose – and to mitigate against adverse consequences from spatial errors. This may include rules for collecting different types of information, such as accuracy standards or individual accreditation.
  - Standards by which the information is held in each repository so that it can be discovered, accessed, assessed and integrated.

#### **4.2. Principle 2. Protects the authoritative source for right of tenure.**

- This principle recognises that the future cadastral industry will be likely to have an expanded scope, but requires the cornerstone of certainty of ownership, underpinning much of the economy, to remain paramount.
- The likely future cadastral industry will have information regulated or controlled to varying degrees corresponding with the consequence of spatial errors. This correspondence is referred to as “optimal regulation” based on the principle that such regulation should be as little as possible but as much as necessary to manage significant risks to the achievement of government outcomes. For example, the level of current regulation applied to cadastral survey and land tenure is relatively high – especially in urban areas - and will remain so. The consequence of an error in defining the spatial extent of tenure, in some cases within centimetres, can strike at investment in land which is the heart of our economy, e.g. if a structure was built or purchased – only to have another party lay claim to a slice of that asset due to ambiguity or overlap in adjoining parcel surveys. Conversely, the consequence of being in error by several metres when defining the spatial extent of public access for

a high country-walking track may be minimal and therefore does not warrant the same degree of accuracy. In some situations, such as the public good right to exercise dogs off the lead in urban areas, the consequence may warrant only voluntary adoption of standard or general control to define the spatial extent of that right.

- Application of this principle will ensure the protection of tenure during any future expansion of the cadastral environment, and indeed this will remain at the highest degree of certainty in the future cadastral industry regardless of technology advances in other areas.

#### **4.3. Principle 3. Central and local government working with the private sector.**

- Building on the statement of a coordinated environment, this acknowledges the range of players in the future cadastral industry.
- Administering statutes is a Crown responsibility and local government, share some responsibilities with central government. The central government role is to:
  - drive the legislative and policy programme to establish rights in statute with the appropriate degree of regulation for the benefit of New Zealand economy, society or environment.
  - provide effective stewardship of government information – receive, store, renovate and provide the information.
  - support and advise industry players in interacting with the repository and complying with respective statutes.
- Local government has responsibility for operational aspects of “resource management” – in New Zealand this term includes planning controls for the development of land, including subdivision. This is a separate regulatory regime – complementary to the cadastral survey and land registration systems managed by central government through LINZ. Local government is usually an early point of contact for anyone planning to establish or change rights in land.
- The private sector component includes:
  - Acting as information providers, processors and users applying best practice to meet the demands of industry clients while operating within the relevant statutes and regulation. While today’s cadastral surveyors fit into this area, how they interact in the future industry will change. There will be a need for access to a greater range of information, to intelligently apply best survey practice, spatial science, legal understanding and to use geospatial information systems to deliver positive outcomes for clients. The greater expectations in this area may be met by cadastral surveyors themselves, other industry players (such as lawyers) or a combination of these.
  - Professional development, including that provided by professional bodies and education institutions, to ensure the people involved in the industry have the required skills and knowledge to meet the statutory requirements and customer demands.

- Providing skills and capability, such as database or other IT services, to assist central and local government in delivering their information management objectives.
- Carrying out other roles that would be inappropriate or inefficient for central or local government to conduct within the machinery of government or where the private sector can make best use of public money.

#### **4.4. Principle 4. Addresses legacy information and changes over time.**

- Moving into the future we must not lose visibility of historic rights or privileges. To do so would only lead to later claims for redress and uncertainty of the spatial extent of complete statutory rights, thereby potentially undermining the whole system.
- New Zealand has in excess of 150 years of information that pre-dates the digital age. Some of the large volumes still held in paper form will have to be moved to digital systems – be it digitally imaged or simply noted on an electronic index with the paper record archived for later manual access.
- Examples of this principle providing benefit is where the Crown is to return acquired land to the original owner, and the acquisition predates, so is not recorded in, the digital system. Similarly with investigations into indigenous rights and historic breaches of treaty provisions. Or a future right associated with dumping a hazardous substance may require defining the spatial extent of hazardous sites that are currently recorded on paper only. In both examples, people accessing these repositories should be given the full picture over time without having to search through masses of paper in a basement or warehouse. Instead, the relevant repositories will have either the digital image or the electronic index to give efficient access to those records. It is the degree of efficiency that each repository can achieve that will set the level of digital imaging versus simply indexing and storing the paper record.
- Those who access and assess the information will be able to determine how the complete picture of rights has changed over time. The application of this feature in trend or cause analysis will support improved decision making.

## **5. INFORMATION CHARACTERISTICS.**

The future cadastral industry will discover and access the information, assess its quality and integrate information for the benefit of the customer and to meet the statutory obligations.

### **5.1. Quality.**

- *Accuracy will be known.* The accuracy of the information collected will be a function or consequence of the reason it was collected, and if this is known then the application of that information for wider use can be assessed confidently. For example, if information is collected with centimetre accuracy, but then processed for another use that reduces the accuracy, this change will be known so that it is not then incorrectly applied with a false confidence that it is still centimetre accurate.

- *Current*. The repositories will be able to provide the most up to date version of the required information. There will not be an in-house version and an out-of-date release version.
- *Complete*. Each repository will show the complete situation in relation to the rights they support – there will not be gaps resulting in the spatial extent being unclear in any given area.
- *Renovated*. The information will be renovated as required rather than being allowed to become obsolete. This renovation will come from two methods:
  - The steward of each repository may have a maintenance regime, actively updating their information with validation from other sources and rectifying identified errors.
  - Each repository is dynamic. While maintained by the steward, it is accessed, processed, updated and re-lodged by the industry as a whole – consistent with relevant regulation. The result is the quality is improved over time.

## 5.2. Access

- *Discoverable*. First and foremost in the access chain is a requirement that people can find the information. This is partly through the first principle where each repository is known in the coordinated environment. Taking that further, that once on the agency's website (or whatever the appropriate access channel is) the information is readily findable.
- Once found the information must be able to be accessed with standard systems for download and at a reasonable cost. New Zealand currently maintains a policy of data users paying only the cost of dissemination for government information with those costs becoming cheaper as technology improves. This may or may not remain in future, but regardless, the cost of access should not be a barrier.
- The access channels must be open nearly continuously (subject only to maintenance requirements) to support industry demands. Given the emphasis on the currency for the information, limiting opportunities to gain access at any time is counterproductive.
- Having accessed the information, it must be able to be understood by a competent lay person. This will allow the appraisal that the information can fit the required purpose.
- The final aspect of access is in meeting the interoperability standards that allow integration with other information so they are aligned and can inform good decision making or communication.

## **6. THE RECOMMENDED CHALLENGES AND RESPECTIVE STRATEGIC OBJECTIVES TO MOVE TOWARDS THIS FUTURE**

### **6.1. Survey Advice**

#### 6.1.1. Challenge.

The function of providing advice to users to support the LINZ repository of cadastral survey information, and the scope of that advice needs to be more clearly defined and efficient to support the integrity of the cadastre.

#### 6.1.2. Strategic objective.

Tomorrow's cadastral survey industry is supported by known sources of credible advice in order to improve efficiency and maintain integrity of the cadastre.

#### 6.1.3. Guiding principles.

- The profession will be the credible source of advice on best practice for conduct of cadastral surveys.
- LINZ will be the credible source of advice for use of the e-survey application and approval processing, exceptional requests and integration into the cadastre.
- Industry wide knowledge management with no gap between the sources of advice held by the profession and LINZ. Furthermore, the sources of advice are to be visible, embedded within these organizations, and not linked to individuals, and evolve with the industry demands.

#### 6.1.4. Contributing actions

- NZIS and LINZ jointly (under a LINZ lead) determine the mix of advice responsibilities from LINZ and NZIS to support the industry.
- NZIS and LINZ conduct individual actions to build their respective and collective capability to provide expert advice.
- Joint sector wide engagement to ensure that all stakeholders are aware of the correct sources of advice

### **6.2. Research and Professional Development Capability.**

6.2.1. Challenge. The cadastral survey industry needs the correct balance of professionals with the ability to do the job, and enquiring minds to lead developments that keep pace with evolving industry demands.

6.2.2. Strategic objective. Surveying professionals are confident they have the skills and knowledge to meet the evolving demands of the cadastral industry.

#### 6.2.3. Guiding principles.

- Actions anchored to National Qualifications Framework<sup>1</sup>.
- Spatial science education supports the future industry requirements.
- Need to have a world class post graduate research programme.
- Professional development opportunities provide clear succession and meet the on the job training demands of the future industry.

#### 6.2.4. Contributing actions.

- NZIS working to reconvene the Board of Studies<sup>2</sup>.
- NZIS to lead the development of a strategically aligned research programme.
- NZIS to lead development of a coordinated professional development programme.

### **6.3. Bulk Survey and Title Data Access and Application.**

6.3.1. Challenge. The current monthly supply of LINZ bulk cadastral information limits the efficiency of many systems and processes within the cadastral industry.

6.3.2. Strategic objective. Access to LINZ bulk survey and title data allows efficiency gains for the cadastral industry.

#### 6.3.3. Guiding principles.

- LINZ will give priority to freeing up cadastral data as part of the federation of geospatial information.
- Improved access will comply with the evolving Spatial Data Infrastructure (SDI).
- LINZ must engage with the wider group of users of cadastral data to optimise efficiency gains.

#### 6.3.4. Contributing actions.

- LINZ will make cadastral data comply with the access and other standards of the emerging NZ SDI
- LINZ engaging with bulk data users to transition to the new access arrangements and achieve efficiency gains.

### **6.4. Integrity of the Survey Data Capture Area**

6.4.1. Challenge. The original assumption on what constitutes the survey data capture (SDC) area has proven incorrect, and the spatial accuracy of the SDC areas is slowly degrading over time.

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<sup>1</sup> New Zealand National Qualifications Framework provides the quality assurance of industry training and education.

<sup>2</sup> The Board of Studies is an industry based group that provides advice to the Otago University Survey School in the development of the survey degree and other programmes.

6.4.2. Strategic objective. SDC areas have genuine survey accuracy to provide spatial confidence and to deliver efficiencies to the future industry

6.4.3. Guiding principles.

- It is not acceptable to maintain status quo.
- The timing and resourcing of additional actions will be in relation to the benefits that are to be delivered.
- Centimetre accuracy will be achieved for urban areas and remaining areas of New Zealand will have at least 1-5 metre accuracy.

6.4.4. Contributing actions.

- LINZ will maintain the current level of maintenance.
- LINZ leads development of the business case to confirm benefits, methods and funding to achieve the required integrity from spatial upgrade.
- LINZ will improve the integrity of the cadastre in accordance with the business case.

## **6.5. Access to LINZ survey and title paper records**

6.5.1. Challenge. Paper records are important even in the digital age, but it is not feasible to convert them all into electronic formats. This leads to access barriers and inefficiency.

6.5.2. Strategic objective. Access to LINZ survey and title paper records is not a cause of inefficiency or incorrect decision making.

6.5.3. Guiding principles.

- The current LINZ strategy for paper records is the vehicle to achieve this objective
- Digitising on demand, based off quality indexes, is acceptable.
- In implementing the strategy, priority will be given to access for the profession over non-land professionals – rural and non SDC areas.

6.5.4. Contributing actions. Implementation of the LINZ strategy with the focus on:

- producing quality electronic indexes,
- working with the profession to establish the priority areas, and
- transition to effective electronic channels when LINZ regional offices close.

## **6.6. Future-proofing the e-survey system (Landonline)**

6.6.1. Challenge. Landonline is a transactional system based on mid 90s technology that is unlikely to meet the demands of the future industry

6.6.2. Strategic objective. The future cadastral survey industry operates confidently, effectively and efficiently in an appropriate electronic environment

6.6.3. Guiding principles.

- Landonline enhancement must benefit the future industry as a whole with prioritised criteria to reflect this.
- Development of the electronic environment is driven by realistic user requirements.

6.6.4. Contributing actions.

- LINZ will lead the development of a process to enhance Landonline to benefit the whole industry.
- LINZ will lead a review the system's effectiveness and efficiency in meeting the user requirements.

## **6.7. Challenges in the wider environment**

6.7.1. Challenge. There is no sector wide approach to move forward

6.7.2. Strategic objective. All stakeholders know their role within the future industry, and know how to carry out their role for the benefit of New Zealand.

6.7.3. Guiding principles.

- The sector wide approach will be built on the LINZ and NZIS partnership.
- LINZ accepts the leadership role to develop the sector wide approach, but it may not be the sector leader in future.
- Future sector leadership will lie with the Government department that Cabinet deems most appropriate.
- The sector wide approach will use the principles of the future cadastral industry as the start point.
- To contribute as an effective professional body that can deliver benefit to members in future, NZIS must move to a model of paid strategic staff.

6.7.4. Contributing actions.

- LINZ will raise awareness among stakeholders of the future cadastral sector on the importance of unlocking the future potential of cadastral information in line with the geospatial strategy and the principles of the future cadastral survey industry.
- LINZ, jointly with NZIS where possible, will engage with the stakeholders to frame a case for the benefits of a sector wide approach, and what that may look like.
- LINZ and NZIS will then support the sector moving forward for the five years to the future state, in particular in the areas where LINZ has a sound platform.
- NZIS will move to the model of paid strategic staff.

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## BIOGRAPHICAL NOTES

### **Dr Don Grant**

Don was appointed Deputy Surveyor-General of New Zealand in 1996 and worked on the Landonline programme for automation of the survey and title systems. Since 2004, Don has been Surveyor-General. As such, he is responsible for the geodetic and cadastral survey systems, and also has responsibilities for electoral boundaries and geographic names. Don was made a Fellow of the NZ Institute of Surveyors in 2007.

Don Grant holds a BSc Honours in Physics from Canterbury University, a Diploma in Surveying from Otago University and a PhD in Surveying from the University of New South Wales. He registered as a surveyor in 1979 and is a licensed cadastral surveyor.

### **Bruce Manners**

Bruce is the Immediate Past President of The New Zealand Institute of Surveyors and currently employed with Aurecon as Asia Pacific Project Delivery Manager for their Community Development and Infrastructure Sector. Bruce is based in Wellington, New Zealand, and prior to his current management role had surveying and land development related positions since graduation from Otago University in 1983.

### **James Dempsey**

James is the Strategy Manager for Customer Service Branch of Land Information New Zealand, a position he has held since October 2008. This Branch has delegated Surveyor-General responsibility for the operational delivery of the geodetic and cadastral systems. James has over 20 years experience as a manager in the New Zealand defence and central government sectors and holds a Masters Degree in Management from the University of Canberra.

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